9 FIBERS - SYNTHETIC

9.1 Introduction to Synthetic Fibers

9.1.1 Objectives

Through completion of this module the trainee will develop the theoretical knowledge to be conversant in:

- The history and use of synthetic fibers;
- Fiber terminology;
- Manufacturing processes for fibers, fabrics and cordage; and
- Chemical formulations and compositions of synthetic fibers.

9.1.2 Required Readings

9.1.2.1 Adolf, Franz-Peter, “The Structure of Textiles: an Introduction to the Basics”, Robertson J. and Grieve M., ed(s), Forensic Examination of Fibers, Taylor and Francis, 1999, pp 33-52.

9.1.2.2 David, Shantha K. and Pailthorpe, “Classification of Textile Fibres: Production, Structure and Properties”, Robertson, J. and Grieve, M., eds., Forensic Examination of Fibres, 2nd ed., Taylor & Francis, 1999, pp. 1-31.

9.1.2.3 Roven, "A Comparison & Evaluation of Techniques for Identification of Synthetic Fibers", *Journal of Forensic Science*, Volume 15, Number 3, pp. 410-432.

9.1.3 Questions

The trainee will provide written answers to the following questions:

- What is the difference between man-made fibers and synthetic fibers?
- Give a brief definition of the chemical composition of the following generic fiber classes:
    - Acetate
    - Triacetate
    - Acrylic
    - Modacrylic
    - Polyamide:
        - Aramid
        - Nylon 6
        - Nylon 6.6
    - Olefin
    - Polyester
    - Rayon
    - Viscose
    - Lyocell
    - Spandex
    - Polyolefins
    - Chlorofibers
    - Fluorofibers
- Discuss, in general, synthetic fiber manufacturing processes.
- Give brief definitions for the following terms:
    - Filament
    - Yarn
    - Tow

- Staple
- Wet spinning
- Dry spinning
- Melt spinning

- Name three types of weave patterns.
- Describe the difference between a dye and a pigment.

9.1.4 Evaluation

9.1.4.1 The trainer will review the written answers to the questions with the trainee.

9.1.4.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.

9.1.4.3 The trainee will be quizzed orally upon the subject matter.

9.2 Recognition, Collection, Packaging and Controls

9.2.1 Objectives

Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:

- Describe to an investigator the proper way to collect fiber evidence;
- Recommend proper packaging for fiber evidence; and,
- Detail the proper controls that are to be taken and why.

9.2.2 Required Readings

9.2.2.1 Biermann, Thomas W., "Fibre Finder Systems", Robertson, J. and Grieve, M., Forensic Examination of Fibres, 2nd ed., Taylor & Francis, 1999, pp. 135-152.

9.2.2.2 Robertson, James and Roux, Claude, "Transfer, Persistance and Recovery of Fibres", Robertson, J. and Grieve, M., Forensic Examination of Fibres, 2nd ed., Taylor & Francis, 1999, pp. 89-100.

9.2.2.3 Springer, Faye, "Collection of Fibre Evidence from Crime Scenes", Robertson, J. and Grieve, M., Forensic Examination of Fibres, 2nd ed., Taylor & Francis, 1999, pp. 101-115.

9.2.2.4 Virginia Division of Forensic Science Evidence Handling Guide.

9.2.3 Questions

- Describe three ways of collecting foreign fibers from clothing.
- Describe the advantages and disadvantages of each the three techniques.
- What type of textile material has good fiber shedding characteristics?
- What type of textile material has good fiber retention properties?
- Why are control fiber samples important?
- How is evidence handled in terms of contamination prevention?

9.2.4 Practical Exercises

9.2.4.1 Demonstrate the druggist or paper fold to the trainer.

9.2.4.2 Demonstrate how you would use post-it-notes to collect loose fibers.

9.2.4.3 Explain to the trainer the information given to an officer over the phone if asked what evidence should be collected in an abduction case where the victim was transported in the suspect's car.

9.2.4.4 Explain to the trainer the information given to an officer regarding evidence to be collected in a rape case where there was contact between the victim and suspect.

9.2.4.5 Explain to the trainer the information given to an officer regarding evidence to be collected in a breaking and entering case where loose fibers can be seen on the edges of the broken window.

9.2.5 Evaluation

9.2.5.1 The trainer will review the written answers to the questions with the trainee.

9.2.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.

9.2.5.3 Review of practical exercises.

9.3 Stereomicroscopic Evaluation of Fibers (and Fabric)

9.3.1 Objectives

Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:

- Use a stereomicroscope properly;
- Work with extremely small samples;
- Identify fibers as natural fibers versus synthetic fibers;
- Discern colors accurately, including pastels;
- Discern unique features and/or surface characteristics;
- Determine the twist of yarns;
- Discern blends of fibers in yarns;
- Recognize and recover fibers from debris, clothing and from tools;
- Describe the weave and knit patterns of a textile/fabric; and,
- Make cross-sections of fibers.

9.3.2 Required Readings

8.3.2.1 Carroll, G. R., "Forensic fibre microscopy", Robertson, J., ed., Forensic Examination of Fibres, 1st ed., Ellis Horwood Ltd., London, 1992, pp. 101-102.

8.3.2.2 David, S.K., Pailthorpe, M.T., "Classifications of Textile Fibres: Production, Structure, and Properties", Robertson, J. and Grieve, M., eds., Forensic Examination of Fibres, 2nd ed., Taylor & Francis, London, 1999, pp. 1-31.

8.3.2.3 Gaudette, B., "The Forensic Aspect of Textile Fiber Examination", Saferstein, R., ed., Forensic Science Handbook, Vol. II, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1988, pp. 209-214 and 239-241.

8.3.2.4 Palenik, S. "Microscopical Examination of fibres", Robertson, J. and Grieve, M., eds., Forensic Examination of Fibres, 2nd ed., Taylor & Francis, London, 1999, pp. 156-159.

8.3.2.5 Robertson, J., "Protocols for Fibre Examination and Initial Preparation", Robertson, J. and Grieve, M., eds., Forensic Examination of Fibres, 2nd ed., Taylor & Francis, London, 1999, pp. 116-134.

9.3.3 Questions

The trainee will provide written answers to the following questions:

- What characteristics can be observed from a microscopic examination of synthetic fibers?
- How does one compare the colors of known and questioned fibers under the stereomicroscope?
- What influence does fiber diameter have at this point in the examination?
- What other fiber characteristics can play a major role in the stereomicroscopic "search" process?
- How does one ensure that the fiber samples will not be contaminated?
- What characteristics cause fibers to be eliminated at this stage?

9.3.4 Practical Exercises

9.3.4.1 The trainer will discuss with the trainee how to take appropriate notes, how to properly use worksheets and what abbreviations are in standard use for fiber analysis.

9.3.4.2 At the stereomicroscope, the trainer will demonstrate/discuss color, luster, diameter (coarse/medium/fine) and any other applicable observed characteristics of different fiber samples (animal and plant). Demonstration by the trainer will include manipulation of single fibers to remove and mount them in an applicable mounting medium.

9.3.4.3 The trainer will provide several fiber samples that are large enough to allow the trainee to familiarize themselves with the manipulation of fibers using the stereomicroscope.

9.3.4.4 The trainee will use the 9.3.4.3 fibers and make cross-sections using different techniques.

9.3.4.5 The trainer will provide a "debris" sample with a known number of fibers. The trainee will search the debris and report the number and color of the fibers recovered.

9.3.4.6 The trainer will provide the trainee with an article of clothing and with a tool or other rigid object, like a piece of glass or plastic, containing foreign fibers for the trainee to recover the fibers.

9.3.4.7 The trainer will provide a variety of fibers and mounting media to the trainee. The trainee will mount the same fibers in each of the mounting media. The trainee should be able to discuss the advantages and disadvantages of the different mounting media.

9.3.4.8 The trainee will identify and diagram/draw different weave and knit patterns.

9.3.4.9 The trainee will be given a variety of cordage to examine. The trainee will determine the diameter, construction and twist of the cordage.

9.3.5 Evaluation

8.3.5.1 The trainer will review the written answers to the questions with the trainee.

8.3.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.

8.3.5.3 Review of practical exercises.

9.4 Microsolubility and Microchemical Testing

9.4.1 Objectives

Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:

- Safely prepare microchemical test reagents;
- Correctly describe the color reactions and/or the solubility of fibers when subjected to different chemicals and reagents; and,
- Correctly identify the generic class of a fiber through microsolubility tests.

9.4.2 Required Readings

9.4.2.1 The Textile Institute, Identification of Textile Materials, 7th ed., Grosvenor Press, Portsmouth, NJ, 1975, pp. 28-29 and 181-187.

9.4.3 Questions

The trainee will provide written answers to the following questions:

- What is the difference between a microsolubility test and a microchemical test?
- What does it mean when a certain fiber dissolves in conc. HCl, but not in 15% HCl?
- What is LeRosen used for in microchemical testing of fibers?
- Should two fibers that have different reactions to any chemical or reagent be eliminated or should more testing be done on the fibers?

9.4.4 Practical Exercises

9.4.4.1 The trainee will assemble the necessary reagents. The trainee will become familiar with the requirements and will perform appropriate QC checks.

9.4.4.2 The trainer will provide the trainee with known samples of fibers including: acetate, acrylic, modacrylic, nylon 6, nylon 6.6, nytril, olefin, polyester, rayon, and spandex. These knowns will be tested using acetone, chloroform, m-cresol, DMF, conc. HCl, conc. HNO_3, 75% H_2SO_4, LeRosen, 15% HCl and HFIP. The results will be recorded on the fiber microchemical worksheet.

8.4.4.3 The trainer will provide the trainee with a “K” and a “Q” fiber sample. The trainee will examine the fibers and characterize as to colors, solubility, microchemical reactions class and determine whether or not they match. Record results on fiber microchemical worksheets.

9.4.5 Evaluation

8.4.5.1 The trainer will review the written answers to the questions with the trainee.

8.4.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.

8.4.5.3 Review of practical exercises.

9.5 Fluorescence

9.5.1 Objectives

Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:

- Operate the fluorescence microscope properly;
- Discern and describe fluorescence colors accurately;
- Communicate the principles of fluorescence microscopy; and,
- Communicate the difference between the fluorescence cubes.

9.5.2 Required Readings

8.5.2.1 Rost, F.W.D., Fluorescence microscopy, Vol. 1, Cambridge University Press, Great Britain, 1996, pp. 1-63 and 104-128.

9.5.3 Questions

The trainee will provide written answers to the following questions:

- What is fluorescence?
- Is fluorescence microscopy a sensible technique to use in fiber comparisons?
- Is fluorescence microscopy suitable for undyed natural fibers?
- Is a difference in fluorescent properties a basis for elimination of two fiber samples?
- What are the most suitable mounting media for fluorescence microscopy and why?

9.5.4 Practical Exercises

9.5.4.1 The trainer will provide the trainee with a minimum of ten fibers for the determination of their fluorescent properties. The fibers should include dyed and non-dyed samples, as well as animal and plant fibers. All four fluorescent cubes will be used and the results recorded using the fluorescence worksheet.

9.5.4.2 The trainer will issue the trainee a minimum of five sets of K & Q fiber samples for comparison of their fluorescence properties. All four fluorescent cubes will be used and the results recorded using the fluorescence worksheet.

9.5.4.2 The trainee will mount fibers from the same source in Xylene substitute, glycerin, Permount, Pro-Texx and Norland Optical adhesive. All four fluorescent cubes will be used and the results recorded using the fluorescence worksheet.

9.5.5 Evaluation

9.5.5.1 The trainer will review the written answers to the questions with the trainee.

9.5.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.

9.5.5.3 Review of practical exercises.

9.6 Polarized Light Microscopy (PLM)

9.6.1 Objectives

Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:

- Use the polarized light microscope properly;
- Communicate the principle of polarized light;
- Set up Köhler illumination on the polarized light microscope;
- Determine the optical properties of fibers;
- Determine the “optical cross-section” of fibers;
- Recognize unique features and/or characteristics in fibers;
- Determine whether a fiber is pigmented or dyed;
- Determine the diameter of a fiber; and,
- Observe and identify bicomponent fibers.

9.6.2 Required Readings

9.6.2.1 Cook, Gordon, Handbook of Textile Fibers, Fifth Edition 1984.

9.6.2.2 Hicks, John, Microscopy of Hair, F.B.I., Issue 2, January 1977.

9.6.2.3 Introduction to Hairs and Fibers Training Course Materials, F.B.I., March 1998.

9.6.2.4 McCrone, Walter C., et.al., Polarized Light Microscopy, Ann Arbor Science Publishers, Inc., Ann Arbor, MI, 1978.

9.6.2.5 Palenik, Samuel J., "Microscopical Examination of Fibres", Robertson, J. and Grieve, M., Forensic Examination of Fibers, 2nd ed., Taylor & Francis, 1999, pp. 153-177.

9.6.2.6 Palenik, S. and Fitzsimons, Forensic Microscopy, "Fiber Cross-Sections: Part II", *Microscope,* 1990 (38) pp. 313-320.

9.6.3 Questions

The trainee will provide written answers to the following questions:

- Define polarized light.
- Describe the steps of setting up Köhler illumination.
- How are interference colors produced?
- Define refractive index.
- Define birefringence.
- Define extinction.
- Define sign of elongation.
- Define pleochroism/dichroism.
- Define compensation.
- How and why are fibers delustered?
- Can the generic class of a fiber be identified with PLM?
- What are bi-component fibers? How are some of them manufactured?

9.6.4 Practical Exercises

9.6.4.1 The trainer will demonstrate to the trainee setting up Köhler illumination on the polarized light microscope, which will include centering the objectives.

9.6.4.2 After a period of practice, the trainee will demonstrate setting up Köhler illumination on the polarized light microscope, which will include centering the objectives.

9.6.4.3 The trainer will issue the trainee with a known set of fibers, including acetate, triacetate, acrylic, modacrylic, nylon 6, nylon 6.6, olefin, polyester, rayon, viscose, lyocell, spandex, and polyolefin. The trainee will determine the optical and physical properties of the fibers and record the results on the fiber worksheet.

9.6.4.4 The trainer will issue the trainee with a set of unknown fibers. The trainee will determine the physical and optical properties of each fiber and identify the fibers according to generic class.

9.6.4.5 The trainer will issue the trainee with a set of fibers with different cross-sectional shapes. The trainee will attempt to identify the cross-sectional shape of each fiber without making cross sections.

9.6.5 Evaluation

9.6.5.1 The trainer will review the written answers to the questions with the trainee.

9.6.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.

9.6.5.3 Review of practical exercises.

9.7 Microspectrophotometry (MSP)

9.7.1 Objectives

Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:

- Communicate the principles of microspectrophotometry;
- Operate the microspectrophotometer in transmittance and reflectance modes;
- Obtain transmittance spectra of fibers in the visible region;
- Discuss the effect of fiber cross-section on the reproducibility of the results; and
- Discuss the effect of focus on the reproducibility of the results.

9.7.2 Required Readings

9.7.2.1 Gaudette, Barry D., "The Forensic Aspects of Textile Fiber Examination", Saferstein, R., Forensic Science Handbook, Vol. 2, Prentice Hall, Englewood Cliffs, NJ, 1988, pp. 245-248.

9.7.2.6 Adolf, Franz-Peter and Dunlop, James, "Microspectrophotometry/Colour Measurement", Robertson J. and Grieve M., ed(s), Forensic Examination of Fibers, pp 251-289.

9.7.2.7 Grieve M., Dunlop J., Haddock P., An Investigation of Known Blue, Red, and Black Dyes Used in the Coloration of Cotton Fibers, Journal of Forensic Science, Vol 35 (2) March 1990, pp. 301-315.

9.7.3 Questions

The trainee will provide written answers to the following questions:

- Define microspectrophotometry.
- Define metamerism.
- What is necessary to perform MSP in the UV region? Can the S.E.E. instrument do this?
- Is a difference in spectral curves a basis for elimination of K and Q fibers?
- Describe how to overcome heterogeneity in a sample when analyzing via MSP?
- How many sample scans should be performed on a single fiber?
- Are lighter colors or darker colors better for MSP purposes?
- Is MSP a good technique for undyed fibers?
- Discuss the expected results from near colorless fibers and near opaque fibers.
- How can weathering affect a fiber's color?
- Would MSP ever be done to compare a pink fiber to a red fiber? Why or why not?

9.7.4 Practical Exercises

9.7.4.1 The trainee will complete the microspectrophotometry section of the training manual.

9.7.4.2 The trainer will issue the trainee with a set of fibers, varying in color. The trainee will obtain 10 transmittance spectra along the length of each fiber. The trainee will evaluate the reproducibility of the spectra and give reasons for possible differences?

9.7.4.3 The trainer will issue the trainee sets of fibers, to include a wide variety of colors. (Example: 3X red fibers, 3X yellow fibers, 3X green fibers, 3X blue fibers....) The trainee will obtain 10 spectra along the length of each fiber. The trainee will evaluate the spectra and notice the different spectral curves of the different fibers. Plotting the mean spectra from 10 readings on each fiber will greatly assist the trainee in evaluating the spectra from different fibers.

9.7.4.4 The trainer will issue the trainee with a set of fibers with a range of cross-sectional shapes. The trainee will obtain 10 spectra along the length of each fiber and evaluate the spectra.

9.7.5 Evaluation

9.7.5.1 The trainer will review the written answers to the questions with the trainee.

9.7.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.

9.7.5.2 Review of practical exercises.

9.8 Fourier Transform Infrared Spectrophotometry (FT-IR)

9.8.1 Objectives

Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:

- Operate the FT-IR properly;
- Correctly identify the generic class of a fiber by its IR spectra;
- Obtain consistent spectral data from different samples from the same source;
- Prepare fiber samples using the micro compression cell with diamond windows;
- Interpret spectral data from different fibers in order to reach a conclusion whether the fibers match or not; and,
- Communicate the limitations of FT-IR.

9.8.2 Required Readings

9.8.2.1 Grieve, M.C., “Another look at the classification of acrylic fibres using FTIR microscopy”, *Science & Justice* 1995, 35, pp. 179-190.

9.8.2.2 Kirkbride, K. P., and Tungol, M. W., Robertson, J. & Grieve, M., Forensic Examination of Fibres, 2nd ed., Taylor & Francis, 1999, pp. 179-222.

9.8.2.3 Tungol, M. W. , et.al., “Forensic Examination of Synthetic Textile Fibers by Microscopic Infrared Spectrometry”, Humecki, H., ed. Practical Guide to Infrared Microspectroscopy, Marcel Dekker, 1995, pp. 245–285.

9.8.2.4 Tungol, et. al., "Analysis of Single Polymer Fibers by FTIR Microscopy: The Results of Case Studies," *Journal of Forensic Sciences*, Vol. 36, No. 4, July 1991, pp. 1027-1043.

9.8.3 Questions

The trainee will provide written answers to the following questions:

- Describe how differences in the pressure applied to the microcompression cell with diamond windows can affect the spectral data.
- Can modacrylic and acrylic fibers be differentiated solely by using FTIR?
- Define generic class and subgeneric class.
- What percentage of a copolymer needs to be present to determine its presence?
- In the characterization of what type of contaminants might FTIR be useful?

9.8.4 Practical Exercises

9.8.4.1 The trainee will successfully complete the FTIR section of the training manual.

9.8.4.2 The trainer will provide the trainee with a set of known fiber samples including acetate, triacetate, acrylic, modacrylic, nylon 6, nylon 6.6, olefin, polyester, rayon, viscose, lyocell, spandex, and polyolefin. The trainee will mount these fibers using the microcompression cell with diamond windows and obtain IR spectra of each fiber type. The trainee will then compare the obtained spectra to known spectra in the IR libraries.

9.8.4.3 The trainee will be given a set of unknown fibers for which they will obtain IR spectra and attempt to identify the fibers by their generic class and, if possible, subclass.

9.8.5 Evaluation

9.8.5.1 The trainer will review the written answers to the questions with the trainee.

9.8.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.

9.8.5.2 Review of practical exercises.

9.9 Pyrolysis Gas Chromatography (PGC)

9.9.1 Objectives

Through completion of this module the trainee will have developed and demonstrated theoretical knowledge and/or practical skills to:

- Explain the theory and operation of the gas chromatograph with the pyroprobe accessory;
- Determine how sample size effects reproducibility; and
- Understand and be able to articulate when it is appropriate to use PGC for fibers.

9.9.2 Required Readings

9.9.2.1 Challinor, John M., “Instrumental Methods Used in Fibre Examination”, Robertson, J. & Grieve, M., Forensic Examination of Fibres, 2nd ed., Taylor & Francis, 1999, pp. 223-238.

9.9.2.2 Janiak & Damereau, "The Application of Pyrolysis and Programmed Temperature Gas Chromatography to the Identification of Textile Fibers," *Journal of Criminal Law, Criminology & Police Science*, Vol. 59, No. 3, pp. 434-439.

9.9.3 Questions

The trainee will provide written answers to the following questions:

- A component present in approximately what concentration will generally not be seen in its pyrogram?
- What are the advantages and disadvantages of the PGC analysis of fibers?

- If you could use PGC or PGC-MS, which would you choose and why?

9.9.4 Practical Exercises

9.9.4.1 The trainee will be given a large enough fiber sample to prepare and run at least three times in order to observe reproducibility. The trainee will run half the starting sample size and record observations regarding reproducibility.

9.9.4.2 The trainee will be given samples from a previous fiber proficiency where PGC has been used. The trainee will analyze the fibers and will compare the data to data that they will generate via FTIR for these samples.

9.9.4.3 The trainee will be given nylon 6 and a nylon 6,6 samples and will analyze them via PGC.

9.9.5 Evaluation

9.9.5.1 The trainer will review the written answers to the questions with the trainee.

9.9.5.2 The trainer and the trainee will review and discuss the pertinent points of each of the required readings.

9.9.5.2 Review of practical exercises.

9.8 Supervised Casework

The trainee will work at least five forensic cases as a technician for a qualified fiber examiner. The trainer should ensure as much variety in the casework as is practicable.

9.9 Forensic Significance of Fibers

The trainer and the trainee will discuss the interpretation of fiber evidence and its relevance and weight in reports and in testimony. Discussions will include probabilities versus possibilities.

9.9.1 Required Readings

9.9.1.1 Champod, Christophe and Taroni, Franco, "The Bayesian Approach", Robertson J. and Grieve M., ed(s), Forensic Examination of Fibers, pp 379-398.

9.9.1.2 Grieve, Michael, "13.1 Influential Factors, Quality Assurance, Report Writing and Case Examples", Robertson J. and Grieve M., ed(s), Forensic Examination of Fibers, pp 363.

9.9.1.3 Pounds, C.A. and Smalldon, K.W., "The Transfer of Fibres Between Clothing Materials During Simulated Contacts and Their Persistence During Wear: Part I – Fibre Transference", *Journal of Forensic Sciences*, 1975, 15, pp. 17-27.

9.9.1.4 Pounds, C.A. and Smalldon, K.W., "The Transfer of Fibres Between Clothing Materials During Simulated Contacts and Their Persistence During Wear: Part II – Fibre Persistence", *Journal of Forensic Sciences*, 1975,15, pp. 29-36.

9.9.1.5 Pounds, C.A. and Smalldon, K.W., "The Transfer of Fibres Between Clothing Materials During Simulated Contacts and Their Persistence During Wear: Part III – A Preliminary Investigation of the Mechanisms Involved", *Journal of Forensic Sciences*, 1975, 15, pp. 197-207.

9.9.1.6 Webb-Salter, Martin and Wiggins, Kenneth G., "13.2 Aids to Interpretation", Robertson J. and Grieve M., ed(s), Forensic Examination of Fibers, pp 364-378.

9.10 Report Writing

The trainer will review and discuss with the trainee the standard report wording in Section 5.6 of the Trace Evidence Standard Operating Procedures.

The trainer will provide ten cases previously examined by other qualified fiber examiners for the trainee to review and discuss with the trainer.

The trainee will draft report wording as a part of the analysis of their training sets as well as when performing supervised casework.

Report writing will be evaluated throughout the training period by the trainer.

9.11 Fiber Presentation and Oral Examination

The trainee will prepare a presentation of approximately 20-30 minutes in length which they will present to a group consisting of qualified fiber examiners, the QA Coordinator, as available, and any Director that chooses to attend. The presentation may cover either: the forensic examination of fibers or a current topic that has been approved by the Section Chief that is of interest to the forensic fiber community.

The trainee will field questions regarding their presentation topic as well as questions related to any/all aspects of their fiber training.

9.12 Competency Evaluation and Mock Trial

9.12.1 As the trainee progresses through fiber training, they will begin to process training sets as they would for casework to include drafting a Certificate of Analysis. There will be a minimum of three of these "case" files completed prior to issuance of the final competency test.

9.12.2 Using one or all of the "cases" from 9.12.1, the trainee will undergo a series of "mini-mock trial" practice sessions with qualified examiners from the Trace Evidence Section. It may be useful to include practice sessions with examiners from Sections other than Trace Evidence.

9.12.3 The trainee will be provided with a final competency test for analysis. This test will mimic actual casework to the maximum extent possible and will include at least two matching fiber samples, one fiber sample that cannot be associated with the others and one identification of a fiber. Additionally, this test will include at least one positive fracture match for those trainees who have not previously completed documented fracture match training.

The trainee will analyze the final competency test samples and issue a Certificate of Analysis based upon their findings. The trainee will be called upon to defend their results via testimony in a formal mock trial setting. The mock trial will typically be scheduled about two weeks after the fiber presentation and oral examination.

9.12.14 The trainer and the trainee will review the mock trial video tape in a timely fashion.

9.13 Reading List

9.13.1 Cook, Gordon, Handbook of Textile Fibers, Fifth Edition 1984.

9.13.2 Grieve, M.C., "Another look at the classification of acrylic fibres using FTIR microscopy", *Science & Justice* 1995, 35, pp. 179-190.

9.13.3 Grieve M., Dunlop J., Haddock P., An Investigation of Known Blue, Red, and Black Dyes Used in the Coloration of Cotton Fibers, *Journal of Forensic Sciences*, Vol. 35 (2) March 1990, pp. 301-315.

9.13.4 Hicks, John, Microscopy of Hair, F.B.I. Issue 2, January 1977.

9.13.5 Humecki, H., ed. Practical Guide to Infrared Microspectroscopy, Marcel Dekker, 1995

9.13.6 Introduction to Hairs and Fibers Training Course Materials, F.B.I., March 1998.

9.1.3.7 Janiak & Damereau, "The Application of Pyrolysis and Programmed Temperature Gas Chromatography to the Identification of Textile Fibers," *Journal of Criminal Law, Criminology & Police Science*, Vol. 59, No. 3, pp. 434-439.

9.13.8 McCrone, Walter C., et.al., Polarized Light Microscopy, Ann Arbor Science Publishers, Inc., Ann Arbor, MI, 1978.

9.13.9 Palenik, S. and Fitzsimons, Forensic Microscopy, Fiber Cross-Sections: Part II, *Microscope*, 1990 (38) pp. 313-320.

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